

Construction and Strategy Analysis of China-US Trade Game Model Under the Impact of COVID-19

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Abstract: The trade friction between China and the United States may seem accidental, but after tracing the differences in values, ideology, economic concepts and the position of global value chains, it is also inevitable. Combined with the impact of COVID-19, the trade game between China and the United States has become an important issue that both sides must face. By creating the game model to analyze the costs and benefits of the china-US trade game, it is concluded that the COVID-19 has intensified the strategic game between the two countries, and there will inevitably be no winner in the trade war of exchanging tariffs. Only between China and the United States can we achieve win-win cooperation. China should constantly strengthen the consciousness of game, create a dynamic game strategy, and eliminate the trade uncertainty as much as possible.

1. Introduction

From the US of unreasonable tariffs on China to the resumption of 25% tariffs on some Chinese goods, US sanctions and Chinese countermeasures have been implemented (as shown in Table 1). It can be seen from the measures of the two countries: (1) the US imposed sanctions against China despite international norms for its own interests; (2) China resolutely responded in the face of unreasonable sanctions; (3) in the face of China's counterattack and the changes in trade between the two countries, the US began to shift from sanctions against China to conditional cooperation.

At a time of tense economic and trade relations between the two countries, the COVID-19 pandemic has swept across the world, hitting the economies of all countries and making china-US trade more sensitive. First, the COVID-19 pandemic has led to economic declines in the two countries, and GNP in China and the US fell by 65% and 4.4% in the first quarter of 2020, respectively, the biggest drop since the financial crisis. Second, the COVID-19 pandemic has hit exports from the two countries. In the first half of 2020, China's exports to the US fell 7% year on year, while the US exports to China fell 1.5% year on year. In addition to the economic impact, the COVID-19 pandemic also shows the differences in political attitudes and diplomatic positions between the two countries. China's regular prevention and control has started to pick up its economic growth rate. At the same time, other countries provide medical assistance, which reflects the dependence of other countries on China and significantly increases their game chips.

Before the change of tariffs, China and the United States were basically stable. Although the trade volume fluctuated due to various objective factors, it remained rising on the whole. So is America's current trade strategy rational? In the face of the impact of COVID-19 and the frequently changing US trade strategy, what measures should China take to protect its own interests from damage? This study takes mutual tariff increase as the starting point, integrates the influencing factors of COVID-19, and analyzes the logic of the emergence and evolution of China-US trade friction by creating a game model, in order to put forward suggestions on sustainable China-US trade.

Table 1. Changes in Sino-US Tariff Policy

stage	time	The United States Tax policy	China's countermeasures
Trade friction began	2018/06	A 25 percent tariff was imposed on us \$50 billion of Chinese goods	A further 25 percent tariff was imposed on US \$50 billion of US goods
	2018/08	A 25 percent tariff was imposed on us \$16 billion of Chinese goods	A 25% tariff on \$16 billion of US goods
Trade friction is fierce	2018/09	An additional 10 percent tariff was imposed on us \$200 billion of Chinese goods	A further 10 percent tariff was imposed on us \$60 billion of US goods
	2019/05	Raise tariffs on \$200 billion of Chinese goods to 25 percent	
	2019/06		Raise tariffs on \$60 billion of US goods to 25 percent
	2019/08	Add in 10 percent tariffs on us \$300 billion of Chinese goods	
	2019/09	Raise tariffs on \$300 billion of Chinese goods to 15 percent	A further 10 percent tariff was imposed on us \$75 billion of US goods
Trade friction eased	2020/01	Signed the first phase of the economic and trade agreement to achieve additional tariffs from rising to lowering	

Note: The data comes from the Chinese Ministry of Foreign Affairs and the Chinese Ministry of Commerce.

2. Game Model Construction

By creating a Sino-US trade game model, study the cooperation and sanctions process adopted by the United States, analyze whether its strategy is rational, and how China develops a targeted game strategy to maximize the benefits (as shown in Figure 1).

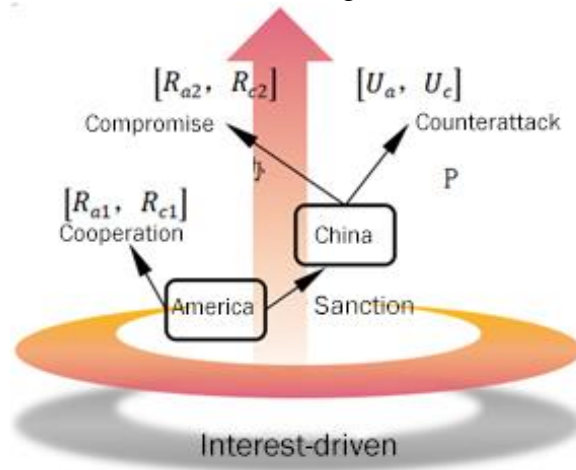


Figure 1. The Sino-US trade game model

China's interest in maintaining existing cooperation is ideal until the tariffs increase, but not for the United States. With the rapid development of China's economy and the continuous breakthroughs in the field of high-tech technology, the dominance of the United States in the industrial chain has been shaken. If it wants to continue to guarantee the interests of the United States, it will inevitably break the status quo, increase tariffs on China and launch a trade war. But

the US is also well aware that if sanctions begin, China will decide whether to take countermeasures based on costs and benefits.

The model assumptions are as follows:

(1) The United States maintains cooperation and does not increase tariffs. At this time, the benefits of the United States and China are R_{A1} with R_{c1} .

(2) The cost of the sanctions imposed by the United States is C_a China has a probability of $1-P$, and if China promises, the benefits of the two countries are R_{A2} with R_{c2} . The P value is influenced by the US strategic decision on China. The smaller the value indicates that the US considers China a lower probability of counterattack, and the larger the value, the high probability of counterattack. If the United States begins the sanctions, the sanctions cost is C_a , If China starts fighting back, the cost is C_c ; The US winning rate in the china-US trade war is P_a , China's winning rate is $1-P_a$; The US gain is U_a China's winning earnings is U_c . If the US does not impose sanctions on China or fails in a trade war, the US will lose its interest V_a That is, the exit cost of the US. For China, the US loses the current considerable benefits, so both China will lose the exit cost V_c . The main parameters are shown in Table 2.

Table 2. Interpretation of the main parameters

variable	explain
P	China's counterattack probability
R_{c1}	U. S. cooperation gains
R_{c2}	China retains earnings
C_c, C_a	Cost between China and the United States
P_a	America's winning probability
U_c, U_a	Winning gains for China and the United States
V_c, V_a	The exit cost of China and the United States

3. The Game Model Analysis

Based on the above assumptions, a comprehensive analysis of various strategy combinations of China and the United States is conducted, and the expected benefits are shown in Tables 3 and Table 4.

If the US chooses to maintain the status quo, obtain conservative gains R_{a1} But to exit cost V_a , Overall earnings are expressed as an $E_{a1}=R_{a1}-V_a$, E_{a1} Probably less than 0; if the US hastily launches a trade war and increases tariffs without determining whether China will counter it, the expected gain can be expressed as an $E_a=P(P_a U_a - C_a) + (1-P)R_{a2}$, E_a Must be greater than E_{a1} ; If China fights hard against the US provocation, the overall US earnings can be expressed as $E_{a3}=(P_a U_a - C_a)$; If China compromise, the overall US earnings can be expressed as $E_{a2}=R_{a2}$; Therefore, the expected benefit of the trade war is obviously higher than the bilateral cooperation when the United States chooses to compromise, but if China firmly fight back, whether the overall benefit of the United States is higher than the bilateral cooperation mainly depends on the retention benefit R_{a1} Exit cost V_a And the victory revenue, U_a And other factors.

For China, if the US remains cooperative, China will reap the biggest revenue $V_c(R_{c1})$; If the US initiates a post-war trade-China compromise, China's overall earnings can be expressed as $E_{c1}=R_{c2}-V_c$, this moment E_{c1} Must be less than 0; if China firmly fights back, its overall earnings can be expressed as $E_{c2}=(1-P_a)U_c - C_c$.

In Both China and the United States, the decisions are based on interests. Only when the

retention of benefits, the cost of withdrawal and the probability of victory meet the conditions, China and the United States take corresponding decisions. If the US expects the loss of the trade war to be higher than the loss of the cooperation, it will inevitably rationally choose the cooperation; similarly, if China expects the benefits of the compromise to be less than the countermeasures benefits, countermeasures are the best choice for China, and China will inevitably implement countermeasures to safeguard its national interests. Thus, income is the decisive factor that determines whether China and the United States can play a rational game.

Table 3: US Expected Earnings

policy	expected revenue	explain
expected revenue	$E_a = P(P_a U_a - C_a) + (1 - P)R_{a2}$	China is expected to have a low probability of countermeasures
China's cooperation	$E_{a1} = R_{a1} - V_a$	$E_{a1} < 0, E_{a1} < E_a$
China's countermeasures	$E_{a3} = (P_a U_a - C_a)$	E_{a3} and E_{a1} depend on R_{a1} V_a U_a
China compromise	$E_{a2} = R_{a2}$	$E_{a2} > E_a > E_{a1}$

Table 4 Expected earnings of China

policy	expected revenue	explain
U. S. cooperation	$E_c = R_{c1}$	$E_c > E_{c1}/E_{c2}$
China compromise	$E_{c1} = R_{c2} - V_c$	$E_{c1} < 0$
China's countermeasures	$E_{c1} = (1 - P_a)U_c - C_c$	E_{a2} and E_{c1} depend on R_{c2} V_c U_c

4. Game Analysis Results

Based on the above analysis and combining the recent decisions of the two countries, the following conclusions can be obtained. The game process is shown in Table 5.

(1) From the perspective of America, the best strategy for "sequential rationality" is to achieve cooperation. But the United States in reality "abnormal" strategy, carry out a series of trade protectionism, frequent trade friction, eventually lead to both sides, which reflects the American policy purpose is not to curb Chinese technology development, thus long control of China's economy, define and contain rivals, maintain its hegemony is a long-term strategic thinking, through a trade war, Japan's economic bubble is the best proof. However, from a practical point of view, the conventional means of the US have long been ineffective for China, and China will not choose to compromise. If the bilateral economic and trade relations develop into an all-out confrontation, the US will not only not achieve the purpose of containing China's development, but also will cost a huge trade war.

(2) From the perspective of China, the optimal solution to the game is to deepen bilateral cooperation. Only through cooperation between China and the United States can we maximize China's interests. From the perspective of the game process, due to China's lack of pioneering advantage, it can only choose either passive countermeasures or compromise. In the face of the US malicious manufacturing friction, based on China's earnings considerations ($E_{c2} > E_{c1}$), Compared with its decisive countermeasures, China's tough attitude is a dominant strategy, which can send a signal of "one damage" to the US, weaken its expected earnings, and encourage the US to correct the probability distribution of its trade game strategy and turn it to cooperation. Judging from the current benefits of China's countermeasures, although its exports have been affected to some extent, they have also gained some bargaining chips, and the United States has also shown a certain

tendency of cooperation.

(3) Whether China and the United States are concerned, the trade games through mutually increased tariffs make both countries suffer irreversible losses, that is, the cost of a trade war. With the deepening of globalization, the economic and trade relations between the two countries are getting closer, so it is impossible to be immune from the game. And with the increasing economic dependence, the exit cost of the two countries will be even greater in the game, and even if they win the trade war, the expected benefits will be lower and lower. In view of this, the two countries should end their current state as soon as possible and maintain negotiations and consultations to achieve win-win cooperation.

Table 5 Sino-us trade game process

nationality	according to	policy
America	China is expected to have a low probability of countermeasures	Launch a trade war
China	$E_{c2} > E_{c1}$	Launch countermeasures
America	Purof correction based on interests	Cooperation between the two sides

5. China's Trade Game Strategy with the US under the COVID-19 Pandemic

(1) Accelerate the process of RMB settlement. Selling US Treasury bonds can produce a significant "herd effect", which will not only panic some countries, but also reduce the confidence of the investment community in the US dollar, thus exacerbating the instability of the US financial market and reducing the US financial hegemony. As China holds a large number of US Treasury bonds, its own interests will inevitably suffer. In this regard, we should accelerate the international settlement process of RMB, and make good use of the international trade advantages of Hong Kong and Macao to improve the position of RMB in the international financial market.

(2) Improve the international trade industry chain. Break through the technology blockade, optimize the industrial upgrading, take the external circulation as the core strategic goal, and improve the discourse power in the formulation of international trade rules. As long as China can form multiple complete industrial chains in the international market, it can greatly reduce its dependence on the United States and make the United States lose its technological threat. Thus, increasing its advantage in the game with the United States can significantly reduce the game cost C_c . It can also improve the game gain E_c . So China will have more choices against export sanctions.

(3) Tariff countermeasures and consultation are jointly promoted. C_a With the time cost, reduce the income after winning U_a . In addition, we should continue to strengthen negotiations with the US, the purpose of which is to achieve china-us cooperation and introduce trade frictions as much as possible, which is a favorable way to push the two sides closer to the optimal strategy. If the US has the intention of cooperation, China should actively promote the bilateral cooperation process at this time, adjust the trade between China and the United States to the most favorable state for itself, and realize the best interests V_c .

6. Conclusion

To sum up, the "abnormal" strategy is that the United States aims to increase the game chip to suppress China. China's response strategy is to force the United States to negotiate and negotiate through special means, which is reasonable and inevitable. The above strategies are always dynamic, not isolated or absolute. The basic principles of implementing the above strategy are: to promote consultation through struggle, to promote communication through countermeasures, and to

strengthen internal construction in the process of maximizing interests, so as to promote global trade liberalization.

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